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ABSTRACT

The author, a neurologist, looks at the nature of reading disabilities. He suggests that many reading disabilities are the result of normal constitutional differences and that the term "minimal brain dysfunction" is rarely appropriate and does not help the remediation process. Noted are various theories which relate neurology and reading ability. (DB)

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NEUROLOGICAL ASPECTS OF READING DISABILITY

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The act of reading as one form of human communication is clearly a complex act that requires the highest level functioning in the central nervous system. It is not surprising then that numerous factors such as constitutional differences, brain injury, biochemical abnormalities, disease states, delayed development, i.e. maturational lag, etc., may result in various levels of function or dysfunction in those systems critical for the reading act and thus result in some degree of reading disability.

The term reading disability is a descriptive term that would imply that the child is not succeeding in learning to read commensurate with his intellectual abilities. As such, it is a less specific term than developmental or specific dyslexia, which, according to the definition of the World Federation of Neurology, is "A disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence and social-cultural opportunity. It is dependent on fundamental cognitive disabilities which are frequently of constitutional origin."

Although the incidence of reading disability depends on many factors, probably at least 10% of the population of school children have a significant degree of reading disability. It would appear that the incidence of specific dyslexia is considerably lower, but again, the incidence depends on how strictly one applies the term.

I would now like to discuss in detail some of those factors which may be important in reading disability from a neurological standpoint.

The first of these is constitutional differences which may or may not be determined on a hereditary basis. Certainly, we are all aware of people who are "gifted" in art or music, which are both forms of human communication, and likewise probably some of us in this audience would be considered as art disabled or music disabled were that the primary means of communication. Excellence in one area of human communication does not necessarily imply excellence in another. There are cases of children who are reading disabled but excel in music. Thus, when one deals with language and reading, it is reasonable to assume that there are those who are "gifted" when it comes to reading and those at the other end of the spectrum who we label as disabled. It is unfair, however, in the majority of cases to further stigmatize the child with reading disability with inappropriately applied labels such as minimal brain dysfunction, brain damaged, brain injured, hyperkinetic syndrome etc., implying there is more to the child's difficulty than constitutional differences. This is not to say that there are not specific instances in which brain damage or minimal brain dysfunction is the cause of the reading disability, but in all likelihood this is the exception rather than the rule.

This brings me to the subject of brain damage, brain injury, and so-called minimal brain dysfunction in relation to reading disability.

Children who have so-called soft neurological signs and/or EEG abnormalities may be labeled as having minimal brain dysfunction. Certainly, some of these may very well have a degree of brain damage as a cause of their reading disability, however, we must bear in mind that a significant percentage of children without any reading or other disability have abnormal EEG's and/or soft neurological signs. Thus, although there is a slight tendency for the children with learning disability to have a higher incidence of abnormal EEG's and soft neurological signs, one is not necessarily justified in jumping to a cause and effect relationship except perhaps

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in selected cases in which there is documented organic abnormalities. One must also bear in mind the observation that the developing nervous system is highly plastic and, as such, has tremendous capabilities to recover from injury with other areas taking over. This is especially true in young children. Thus, children with injury to the dominant hemisphere at an early age will usually develop language function in the non-dominant hemisphere.

There are numerous other theories that have been proposed in relation to reading disability and I will briefly comment on these.

The first is the so-called maturational lag theory which basically says that certain areas in the brains of children with reading disability may develop more slowly than normals. Evidence for this comes from the observation that the angular gyrus of the brain which is crucial for the reading process is one of the last areas to become myelinated and myelination is generally thought to be associated with an area becoming functional. In addition, some children with reading disability tend to outgrow it as they get older. This theory is not necessarily inconsistent with the constitutional differences theory since rate of development or maturation of the brain may be constitutionally determined.

Another popular theory of reading disability relates to either failure or late development of cerebral dominance. There are many problems related to tests of cerebral dominance and certainly results of studies of this factor have not been clear-cut. There may be some relationship between maturational lag and delayed development of dominance. Certainly, one factor relating to development of dominance is myelination of the corpus callosum which generally is not completed until age 2-3 and, until this occurs, the two hemispheres must function relatively independently. This probably accounts for the fact that the non-dominant right hemisphere develops primitive language function. This is demonstrated by the ability of a person who has had their corpus callosum divided to select and point to an object out of a group of objects after the name of the object is shown to the left half of the visual field. This visual field projects exclusively to the right hemisphere and with division of the corpus callosum the right hemisphere is isolated from the left. This person is unable to say the name of the object, however, since the information cannot be transmitted to the dominant left hemisphere which subserves speech.

There is one theory I would like to bring up only to discourage its use. This theory attempts to explain was-saw and b-d reversals by the concept that a mirror image of the word is seen by the non-dominant right hemisphere which, because of delayed or impaired development of dominance, competes with the dominant hemisphere image. From an anatomical basis alone one can discount this theory since, if this were the case, all images arising in the left half of the visual field would be reversed, not just selected images such as was-saw, and there would be a discontinuity across the visual midline. Again, I mention this only to discourage its use since the concept violates known anatomic and physiologic facts.

This brings me to the question of what type of medical evaluation, if any, is indicated in a child with reading disability. Certainly, both from a logistics and cost effectiveness standpoint it is not reasonable or practical for each child with reading disability to have a medical-neurological and EEG work-up. There are, however, certain situations in which a complete medical evaluation would be advisable. Examples of this include a child whose performance level and intellectual capabilities appear to be deteriorating, a child who is suspected of having seizures, a child who has hearing or visual impairment, or a child who has or develops frank neurological abnormalities or complaints referable to the central nervous system. In addition, a complete medical evaluation may be advisable in selected cases to reassure the parents. Children who suffer from learning or reading disability in association with behavioral abnormalities may benefit from a psychological or psychiatric evaluation and treatment, if indicated.

To summarize, it is apparent that there is a significant percentage of school age children in whom acquisition of reading and language skills is impaired or delayed. Although numerous factors may be involved in each case, it is apparent that in the

majority of cases reading disability would appear to have a constitutionally determined neurologic basis and only in selected cases is the disability due to injury or disease.

By use of the term constitutionally determined neurologic basis I mean that one's ability to learn to read depends in large part on how well the brain is able to learn and function in the language sphere and is not meant to imply a pathological process in the nervous system.

I feel it is important not to stigmatize children with labels such as minimal brain dysfunction or brain injured except in those cases in which this is clearly the case. The emphasis should be toward a better understanding of what strengths and weaknesses a poor reader has and then attempt to structure his reading program to build on those strengths and ameliorate the weaknesses.

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